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23 July 1963

MEMORANDUM FOR : Deputy Director of Central Intelligence
THROUGH : Acting Deputy Director (Research) (8) 4 b 6
SUBJECT : Proposed Operation of U-2 Aircraft from Aircraft
Carrier

This Staff Study contains recommendations for the approval of the Deputy Director of Central Intelligence; these recommendations are contained in Paragraph V.

I. PROBLEM:

To determine the feasibility, cost, and level of effort required to furnish an operating capability for U-2 aircraft from aircraft carriers.

II. FACTS BEARING ON THE PROBLEM:

A. Advantages of Carrier Operations:

1. Carrier operations would permit a wide choice of operating locations for the launch of IDEALIST U-2 overflights. In theory at least, the oceans of the world (minus the territorial waters of hostile countries) are available as launch and/or retrieval areas. This flexibility and mobility can deny unfriendly radar nets the advantage of monitoring activities and known or probable IDEALIST U-2 bases.
2. IDEALIST operations conducted from aircraft carriers would be entirely under the control of the United States Government. This would eliminate the involvement of second or even third countries in IDEALIST operations, simplifying the political clearance problem immeasurably and theoretically cutting down the time lost in deployment in those cases where deployment cannot take place until political negotiations for land bases have been consummated.

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3. Although not designed for carrier operations, preliminary engineering analyses indicate that at relatively small cost and within a reasonable time span, a minimum of two U-2 aircraft can be structurally modified to permit the proposed carrier operations. Examination of available United States aircraft carrier facilities by principal members of OSA and senior contractor personnel within the past sixty days discloses no area of disabling deficiency in terms of logistics, communications, or operational support.
4. Within the general statement above, it is a fact, however, that of the presently in-commission United States Navy carriers, consideration of U-2 operations should be in all probability limited to certain of the attack carriers (Navy designation "CVA"). The most feasible CVA's for U-2 operations are the SARATOGA, RANGER, and INDEPENDENCE, all of which offer an ideally situated and physically segregated operating facility known as the Airborne Systems Support Center (ASSC). The balance of the seven CVA's favored for this operation would ultimately be modified to include the ASSC, but probably not until calendar 1964 and thereafter as funds are available.
5. In addition to the flexibility alluded to above, it should be noted that based on present evidence, those carriers with the ASSC facility offer the additional advantage of adequate space for the complete processing and initial flash readout of both "B" camera and tracker film. Original negatives can be produced and PI'd on board with only a small modification to existing Navy processing facilities on ship. Present Navy carrier processing capability in equipment and trained manpower is inadequate, having been designed for other reconnaissance systems with different technical parameters. Present estimates are that the on-board processing capability would cost in the neighborhood of from [Redacted] in capital equipment, 25X1 depending upon numbers of copies to be produced and titled. This equipment could be moved on and off the carrier when not required. Supplemental technical representatives (a total of twelve in all) to furnish a full processing capability on board would be furnished by Eastman Kodak as a team at approximately [Redacted] per month based on three missions per month for that period when their services aboard ship were required. Adoption of an on-board processing and PI capability would eliminate one of the potential [Redacted]

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disadvantages of carrier operations, namely the time lost in transportation of mission take from the carrier to an adequately equipped processing facility on shore, as well as the hazard of losing the original negative before it has been duplicated.

6. In addition to offering advantages tactically in the launch phase of operations, a carrier-based U-2 can return to its launch point under carefully controlled approach conditions from as far as 300 miles away from the ship. In addition, the ship itself can maneuver to receive the aircraft under conditions of optimum weather, wind, and visibility, a feature not enjoyed by a fixed land base.

B. Disadvantages of Carrier Operations:

1. The principal disadvantage of carrier operations would be the exposure of the U-2 capability to as large a group of uncleared individuals as would be present on a CVA attack carrier with its air group aboard. Such a carrier would have in the neighborhood of 4,200 people, not including the U-2 Detachment, and even though Navy carriers can today operate without supporting task forces, it would be impossible to conceal the existence of the U-2 on board ship and to deny from the crew the knowledge of when flights took place. Certain steps can be taken to minimize the exposure of the aircraft and to prevent unauthorized speculation as to its mission, but no such system offers airtight security.
2. Although the range and altitude performance of a carrier-modified U-2 will not be known accurately until after a vehicle so configured is test-flown, the process of "beefing up" the aircraft's structure and installing adequate arresting gear and modifying the landing gear will add a certain weight penalty. The aircraft designer is currently forecasting a net penalty in the neighborhood of 300 pounds for the carrier modification. It may be that this penalty will eventually be larger than that conservative figure, which itself is less than half of what might be referred to as a "normal weight penalty" associated with this modification. Although it is theoretically possible to land a U-2 on a carrier deck with the ship underway without carrier arresting gear, such an operation would be decidedly marginal from a safety point of view, and is consequently not recommended.

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3. Modifying even so small a number of U-2's as the pair now under consideration will require carrier conversion training for all IDEALIST Detachment pilots. In addition, T/O provision will have to be made for a Navy Landing Signals Officer to not only qualify in the aircraft himself, but to be present on the carrier at all times when U-2 flight operations are taking place. Once carrier qualification has been established for IDEALIST pilots, repeated requalification will be required as long as the carrier capability is kept alive.
4. Resupply for a carrier-based IDEALIST Detachment cannot be accomplished as readily as it can for a land-based unit, despite the Navy's excellent under way replenishment system. A ship-based detachment will require enlarged kits of special items, such as spare parts, electronic and camera equipment, etc. Fuel must be loaded aboard and segregated from other fuel, possibly well in advance of anticipated use. In view of the periodic repositioning of carriers in the Fleet, it may be advisable and necessary to preposition fuel on several such ships, thus adding somewhat to the complexity of the operation.
5. Even as modified for carrier operations, the U-2 will not in any sense be a fully-qualified carrier aircraft. Its handling, launching, and retrieval will always have to be considered as a special operation, requiring the exercise of considerable technical skill both from ground support personnel and pilots. As an example of the aerodynamic limitations of the U-2 in the converted configuration, it should be noted that in designing a true carrier aircraft, Lockheed made the T2V trainer, capable of withstanding arresting landings where deceleration is as high as from 17 to 20 feet per second. These were the specifications called for by the United States Navy. In its modified configuration, the U-2 will probably not be stressed for deceleration greater than 10 feet per second, which is approximately twice its present stress and still only about 60 percent as much as a true carrier aircraft. The designer holds, however, that this disparity is not critical when the aircraft is operated at the prescribed approach speed of roughly 85 knots and when the carrier is moving at its maximum recovery speed of roughly 33 knots. The

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relative speed reduces the arresting impact to the redesigned maximum tolerances. It would impose an unacceptable weight penalty on the U-2 to make it capable of being arrested at the 85 knot figure. The pitch rate of the aircraft after hook engagement, perhaps the most critical aspect of carrier landings with the U-2, is said to be well within acceptable safety limits according to present computer calculations made by Lockheed. The only on-deck modification to the carrier itself would be the substitution of smaller diameter arresting cables to reduce stress forces on the U-2 in landing or takeoff as cables are overrun. Standard cabling is on the order of 1 1/2 inches in diameter. A 1/2 inch cable is proposed for use during U-2 operations.

III. DISCUSSION:

A. Since 1 May 1960 and following the torrent of world-wide publicity associated with the U-2 incident, the problem of obtaining even temporary staging rights in friendly foreign countries has been growing progressively more complicated. Because of the notoriety associated with the aircraft, its appearance in a foreign country, if detected, is quite apt to produce political problems for the host country. This is apt to be true even in those instances where the host country is not subject to immediate pressure by the Soviet Union and is sometimes a function of internal domestic politics within the host government.

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B. Given the state of affairs alluded to above, resorting to carrier operations is a hopeful prospect not only for coverage of those targets not easily reached from friendly foreign soil, but for any critical operations where valuable time cannot be expended in protracted political negotiations. The basic question then is whether or not this aircraft can be economically adapted to work from carriers with an acceptable margin

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of safety in flight operations, and, once so adapted, can it operate with frequency varying from occasional to repeated in this manner without affecting the Navy's disposition of forces under existing Navy Single Integrated Operational Plan (SIOP) commitments. As indicated earlier, present engineering analyses confirm that the aircraft can be so operated theoretically as to produce a viable carrier capability for reconnaissance purposes. Aside from the unknown range and altitude characteristics of the converted aircraft (which will depend upon arresting gear weight for the most part), the only apparent aerodynamic question is associated with the behavior of the aircraft in the landing configuration when it is approaching a fast moving carrier from the stern. One suggestion which has been made is that the standard angle of attack for such an approach with Navy aircraft which is three or four degrees to the horizontal be reduced to approximately 1 1/2 to 2 degrees in the case of the U-2 to permit a flatter angle of approach with power on so that "ballooning" of the aircraft prior to contact with the deck will be minimized. In a normal landing attitude, the U-2 rides tail high, which unless it is compensated for by a skillful power-on approach just above the stall speed may make the engagement of a carrier hook relatively difficult. There is a possibility that a problem may exist in wind pattern over the stern of a fast moving carrier, which according to Navy statistics, normally produces a down-draft immediately to the rear of the stern, followed by an up-draft from 1,000 to 1,500 feet aft of the carrier. With its sizeable wing area and with flaps fully extended, there may be some adjustments in technique which will have to be accomplished in order to overcome the possible adverse effects of these phenomena. Stack wash from the carrier's funnels can largely be eliminated as a deterrent characteristic, since carriers on which the U-2 would be landed make their arrested landings on the angled deck, approximately nine degrees from the central axis of the hull away from the island, and the captains of both the USS LEXINGTON and USS INDEPENDENCE stated categorically that they "could put the stack wash wherever the pilot wanted it". This, of course, means that they could adjust the carrier's steaming angle to take maximum advantage of existing wind conditions to deflect stack wash. The only time this might be a modest problem would be when the aircraft is landed in a no wind condition, at which time it must rely solely on the carrier's forward momentum for relative wind.

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C. Movement of the aircraft from the hangar deck to the flight deck and conversely can be accomplished, despite the fact that no carrier in the United States Navy has elevators large enough to accommodate the U-2 without a portion of the wing extending beyond the outboard edge of the elevator. The largest elevator in the Fleet measures only 70 by 52 feet, while those on the carriers in the group most likely to be employed in U-2 operations (CVA's 59 through 62), measure 63 by 52 feet. Lockheed has designed a special fuselage cart called a "LOWBOY", which permits side castering operations essential to movement from the hangar deck floor to the elevator and from the flight deck to the elevator, etc. This will be equipped with adjustable brakes to prevent any incident should the aircraft be on the elevator during period of rough weather. In addition, Lockheed has manufactured a special sling using a fuselage cart as the basic ingredient, which will permit on and off-loading of the aircraft from the carrier when it is necessary to remove it or replace it aboard other than under its own power. The hangar deck offers adequate space for a compartmentalized working and refueling area. Minor adjustments in the aircraft component of an operational carrier must be made to provide adequate storage space on the hangar deck, but Navy assures us that this is an administrative problem which can be encompassed by proper direction from higher authorities, beginning with the Chief of Naval Support and the CNO, augmented by the Joint Chiefs of Staff in those cases where such temporary depletion of the Air Carrier Group would affect the Navy's SIOP capabilities.

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E. On the subject of modified costs and equipment proposed for the U-2 in the carrier configuration, present estimates are that the complete carrier modification on two aircraft can be furnished by Lockheed at a cost [redacted]. This figure represents the savings implicit in accomplishing the modification at the time these aircraft are also converted from J-57 to J-75 models, a course of action now underway. According to present plans, the first carrier-configured U-2 should be rolled out of the Lockheed plant at Burbank late in November 1963. It is expected that the second aircraft would follow approximately nine weeks thereafter. A program of flight test and shake-down will follow roll-out and is expected to take up to sixty days. Thus it is probably realistic to assume the existence of a single aircraft carrier capability no earlier than 1 February 1964, with the full two-plane capability by 1 April 1964 barring unforeseen difficulties. At present it is our feeling that maximum flexibility in terms of the operating envelope will result from equipping one of the two aircraft with ARS and beacon, while leaving the other essentially out of this capability. Final configuration will not be fixed upon until the results of the 5 August carrier launch trial are known. The net difference in weight between these aircraft then would be approximately 325 pounds, and the stalling speed of the ARS equipped aircraft would be approximately 2 to 3 knots higher than without ARS. The inclusion of ARS in one aircraft provides a capability to operate under the worst situation anticipated in carrier operations, namely launch from a carrier at sea followed by refueling in order to reach an appropriate land base in friendly territory. No

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weight penalty in terms of additional airframe strengthening is required for the ARS configured aircraft. Both carrier aircraft will be equipped with single side band radios which are compatible with carrier SSB installation, thus permitting not only mission recall, but emergency communications from the ship to the aircraft in the event of hostile action or mechanical malfunction. Such equipment is standardized within the IDEALIST U-2 fleet.

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G. Carrier operation is a new and unique experience for IDEALIST Detachments, and it will require some familiarization training. Both pilots and ground handling personnel will have to meld into the life of the carrier so that IDEALIST missions can be launched expeditiously. On the other hand, IDEALIST staging detachments being small and all persons involved providing mutual support, the carrier detachment should operate as a unit. A United States Navy officer thoroughly familiar with carrier

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operation can provide guidance for planning at Headquarters and also provide briefing and advice for IDEALIST Detachments prior to moving aboard a carrier.

- H. The ultimate use of aircraft carriers for the U-2 depends on the availability of carriers in or near the desired area of launch. To direct a large carrier to support a U-2 sortie or series of sorties requires approval by the highest levels of the Department of Defense. A clear plan for execution which requires carrier support for the shortest possible time span will go far toward getting a carrier when it is requested.
- I. Contact was established with the Office of the Commander, Naval Air Training Command, NAS, Pensacola in June for the purpose of discussing carrier conversion training for IDEALIST pilots. The Chief of Staff, NATC, stated that such a group could be accommodated with little inconvenience and furnished a syllabus which would include ground school in the training aircraft, plotting board navigation classes, checkout in the T2A jet trainer, and approximately twenty arrested carrier landings on the USS LEXINGTON (CVS) utilized for this purpose by NATC. The total flight time involved would be approximately thirty flying hours, and the duration of the training at Pensacola would be four or five weeks, depending upon weather. Reimbursability for this training was not discussed. An alternate training location of NAS, Monterrey (California) is also under investigation for this purpose by Navy.

IV. CONCLUSIONS:

- A. The employment of U-2's aboard United States Navy aircraft carriers of the CVA attack carrier type is both possible and productive. There appear to be no technical or engineering obstacles to their projected use in this manner.
- B. United States Navy assistance in establishing operational procedures, as well as pilot training, is advisable.
- C. Two U-2 aircraft can economically be modified for carrier operations within an acceptable time span.

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D. The frequency of carrier-launched U-2 flights will depend upon the priority of targeting requirements.

V. RECOMMENDATIONS:

- A. That concurrence of the D/NRO in this program be obtained.
- B. That Lockheed Aircraft Corporation be authorized to modify two U-2 aircraft now in J-75 conversion for carrier operations without delay. Final configuration of the carrier version should be fixed only after results of the August launch trials are known.
- C. That Navy assistance be sought in training all IDEALIST U-2 pilots in carrier operations.
- D. That Navy authorities be consulted to determine methods of operation and procedures for minimizing inconvenience to normal Navy carrier routines.
- E. That the United States Navy be asked to detail a Landing Signals Officer (carrier-qualified pilot) for coordination checkout in the U-2 and assignment to the IDEALIST Detachment.
- F. That a set of communications procedures for projected carrier operations be expeditiously accomplished with Navy assistance.
- G. That the development of a carrier-based processing facility be approved in principle. This capability would provide a minimum of one original and a duplicate negative to be provided on board ship.
- H. That a suitable cover story for long range carrier-based U-2 operations be promptly drawn up with Navy assistance and coordinated with the so-called Ad Hoc Cover Committee.

JAMES A. CUNNINGHAM, JR.
Deputy Assistant Director
(Special Activities)

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Recommendations in Paragraph V APPROVED:

SIGNED

Marshall S. Carter
Lieutenant General, USA
Deputy Director

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